

CANCER IN SOUTH-WEST ENGLAND

Bradshaw Lecture delivered at the Royal College of Surgeons of England

on

13th December 1967

by

R. Milnes Walker, C.B.E., M.S., F.R.C.S., Hon. F.A.C.S.

Vice-President, Royal College of Surgeons of England; Professor Emeritus, University of Bristol

THIS IS THE 80th lecture to be given in this College to honour the memory of William Wood Bradshaw, a Bristolian by parentage, who practised in Andover and Reading and who died in 1866. His widow perpetuated his memory by founding these lectureships in the two Royal Medical Colleges which then existed in London. Of the 79 lectures already delivered a number have dealt with cancer as it appears in a particular form or in certain sites. Nine lectures have considered the disease in a wider range.

In the third lecture, William Savory of St. Bartholomew's Hospital discussed the pathology of cancer and concluded with the sentence: "Before we shall ever be able to answer the question of why or how do tumours form, it seems to me that we must be able to solve the problem of normal growth and development, and to answer the question why or how it is that these continue up to a certain point and then suddenly cease". This question remains unanswered to-day, more than 80 years later, in spite of all the advances in our knowledge of the biochemistry of the cell.

Early in the present century four successive lecturers considered the cancer problem. In 1903 Henry Morris of the Middlesex Hospital fully accepted Cohnheim's theory of the origin of cancer from cell nests, but he was refuted two years later by Henry Butlin of St. Bartholomew's, who considered that cancer was a parasitic disease. Mayo Robson of Leeds in 1904 and Edmund Owen of St. Mary's Hospital in 1906 reviewed the methods of treatment that were in use at the time. The former put in a plea for the more energetic treatment of precancerous conditions as a means of lowering mortality. Owen was a firm believer in the knife and said, "the only way in which the cure of a cancer can be obtained is by its prompt and thorough removal by operation". At that time irradiation treatment was in its infancy and he would have none of it, but Mayo Robson did appreciate its value in the treatment of rodent ulcers.

The next Bradshaw lecture which dealt with cancer in general was in 1910 from the lips of Sir Alfred Pearce Gould of the Middlesex Hospital. He described much of the research being carried out in the early years of the laboratories of the Imperial Cancer Research Fund, but the main interest of his lecture for us is that he dwelt at some length on immunity to cancer, a subject which has attracted more attention again in the last few years as a means of prevention and treatment.

In 1912 Charles Mansell-Moullin of St. Bartholomew's spoke on the "Biology of Tumours", and in 1921 Holburt Waring of the same hospital gave as his title "The Operative Treatment of Malignant Disease" and dismissed irradiation treatment with the remark that in his opinion, up to that time, many more cases had been rendered inoperable, and therefore incurable, by X-rays and radium, than had been cured by these agents, but he went on to admit that they had a place in surgically inoperable cases, where much alleviation of suffering and some prolongation of days might be obtained.

It was not until Britain was again at war that another lecture dealt with general aspects of cancer, and this was by Sir Alfred Webb-Johnson, entitled "Pride and Prejudice in the Treatment of Cancer". This was a plea for a standard means of collecting and tabulating information, the rational use of all methods of treatment which were available, the setting up of special tumour clinics and the formation of teams of surgeons, radiotherapists, pathologists and physicians. If I may quote one of his remarks: "The study of cancer statistics is very difficult for there has been no uniform system of keeping records or estimating results. Even when statutory and other bodies have collected information, they have acted independently, and, as if inspired by some imp of mischief, have adopted different methods of arriving at survival rates." At that time the Cancer Act of 1939 had just been placed on the statute book, and this laid the responsibility on the local authorities for seeing that facilities for treatment of cancer were available for everyone. It was, of course, superseded by the National Health Act, but it did lead to the setting up of cancer organizations throughout the country, and it is the outcome of two of these organizations which will form the main theme of my lecture to-day.

Sir Alfred Webb-Johnson covered the whole field, and much that he foresaw has come about, but there is one remark which sounds a little ironic to-day when he stated that those who fear for the future of the voluntary hospitals should note the words of the Chief Medical Officer of the Ministry of Health that "only by co-operation in hospital services regionally and nationally will the difficulties of expense of voluntary hospitals be overcome and the voluntary principles of which this country is so proud be safeguarded".

It is now 27 years since Sir Alfred gave his Bradshaw lecture but there is much in it which is still of value.

Cancer registration

Cancer registration began in Britain in 1930, when it was established in a few centres by the Radium Commission which had been set up in the previous year, primarily to organize the use and distribution of radium which had been provided by the government. At first registration covered only those patients who were being treated by radium or other methods of irradiation, and it was not for some years that attempts were made to

include others. The introduction of the National Health Service opened the prospect of registration of all cases of malignant disease, at least of all who were treated under the Service.

In the south-west of England cancer registration began in 1945 under the auspices of the Radium Commission with an office in Bristol for the counties of Gloucester, Somerset and Wiltshire and the county boroughs of Bath, Bristol and Gloucester. It was my predecessor, Professor Rendle Short, who was most active in getting this started, and when he retired from the Chair of Surgery he became director of the bureau. In 1947 Mr. Duncan Wood was appointed director of a separate office in Plymouth for the counties of Devon and Cornwall; he had a wider task for he acted as an adviser on the management of patients as well as collecting the statistical data. At first registration was confined to those patients who were treated in a limited number of hospitals, but for about the last 15 years all the hospitals in the region have supported the scheme. With the additional notification to the registry of all persons who are certified as dying of cancer, registration is as complete as possible but, as will be pointed out later, a few cases slip through the net. In 1948, when the Regional Boards took over the administration of the hospitals, the Registries also came under their aegis, and the South-western Regional Hospital Board has done all in its power to maintain this service.

In 1952 Mr. Reginald Vick became director of both the offices in the region. The work which he did over the next 13 years is well known, and it is to him that I am indebted for much of the information which I am passing on to you to-day.

The Registries cover a population of just over three million people in the counties of Gloucester, Somerset, Devon, Cornwall and part of Wiltshire and the borough of Lyme Regis, and in recent years rather more than 10,000 cases of cancer have been registered each year. Some of these cases prove on further investigation not to be malignant, so that the actual numbers are rather lower than the original registrations. Only recently, in reviewing the five-year survival of patients treated in 1960, there was a patient whose diagnosis, with a pathological report of a sample of tissue taken at operation, had been given as secondary carcinoma of the liver; when she was found to be in excellent health five years later the case and the slides were reviewed and revealed the classical error of gummata being mistaken for true tumours.

The records are used mainly for the study of the incidence of cancer and the survival rates. After 20 years it is possible to begin the study of changes which are taking place in both these aspects. The details given are hardly adequate to provide a comparison between different methods of treatment, but they do supply a means whereby those who are interested can find the case records if such an investigation is being undertaken.

Quite apart from this bureau there are in Bristol special registries for the study of bone tumours, bladder tumours and malignant melanomas organized by clinicians for particular studies.

Accuracy of cancer records

The accuracy of the records has been questioned, and no-one would claim that they are completely accurate. It is not infrequent to find that the diagnosis registered by the hospital differs from that put on the death certificate; in such a case a copy of the hospital notes is obtained and with all the information available an attempt is made to arrive at the correct diagnosis. Not infrequently the death certificate is filled in before an autopsy is made, and if something unexpected is found it may be put in the hospital records, but the General Registry Office is not informed. Alternatively a diagnosis may be notified to the bureau, but as a result of further investigations the diagnosis may be changed, and we are not always informed.

Alderson and Meade (1967) made an investigation of this subject in the Oxford Region and found that in 39 per cent of 1,216 patients who had died in hospitals there was a discrepancy between the hospital diagnosis and the death certificate diagnosis. Nearly all the differences were due to the entering on the death certificate of a complication or of another condition incidental to the main illness as the "principle condition treated" or as the "underlying cause of death". However, they found that the discrepancies were least common when malignant conditions were concerned.

Faulkner *et al.* (1967) looked into the matter nearer home, comparing the diagnosis by hospital records and any other relevant information with the death certificates of 2,243 people who died in Bristol in 1962 and 1963. Amongst them there were 554 due to malignant neoplasms, and they found that the information in the Cancer Registry was correct in 86.6 per cent and was complete in 79.9 per cent. In a further 10.5 per cent there was information in the Registry which, though not entirely correct, could be used as a reference to elicit the correct information. Only 3 per cent of the patients who died had not been notified and placed on the Register.

It is in those conditions where there is a high proportion of untreated cases, many of whom never go to hospital, that most errors are made. Thus these writers found that complete and correct information was available in 91.4 per cent of lung cancers, 85.5 per cent for the stomach, 78.6 per cent for the colon and 80.0 per cent for the rectum and the pancreas. For superficial tumours the figures were much better, with 98.3 per cent for breast cancer and 100 per cent for the bladder, penis, testis and thyroid, though in these examples the figures were small and hardly significant.

Cancer incidence

Much has been done to implement Webb-Johnson's plea for the standardization of records and the methods of estimating results. Even though there is now a standard international classification of diseases which is adopted by most cancer registries, there are differences in the way in which the information is obtained, and thus it is not always easy to compare the incidence of the various forms of cancer in different countries and even in different regions of one country. A comparison of the incidence may bring to light important aetiological factors, as for example the recent observation that cancer of the nasal cavities is particularly prevalent amongst woodworkers in the High Wycombe area (Acheson *et al.*, 1967).

Dr. Richard Doll (1967) in his Rock Carling Lecture this year gave an account of some of the tremendous variations which occur in the incidence of cancer in different parts of the world. For example, cancer of the oesophagus in men in part of Kazakstan has an incidence 200 times that found in Holland, and cancer of the stomach in Iceland is 30 times as common as it is in Uganda. There may be recognized causes for some of these variations, such as the association of chewing betel nut and cancer of the mouth, but everywhere the age distribution of the population plays its part. One would not expect to find such wide variations within the confines of one country, but figures are available which give some information of the variable incidence in different parts of Great Britain (Doll *et al.*, 1966), perhaps the best known example being the high incidence of cancer of the stomach in North Wales. Even in a single region variations may be found, as I shall show by some examples later. Investigations into this aspect are only just being started in the south-western region, and few figures on which reliable conclusions can be based are available.

Parts of south-west England, particularly the coastal areas with their soft but sometimes stormy climate, attract many elderly people who have retired, and it is therefore not surprising that the average age of the population is higher than the rest of England and Wales. In the country as a whole, taking the 1961 census figures, 30.9 per cent of the population are aged 50 or over, but in the south-western region this figure is 33.3 per cent. When we look at the different parts of the region we see how much greater the variation is. In the part of Wiltshire which comes within the region only 28.5 per cent of the population are over 50 years; in Gloucester City the figure is 28.7, and in Gloucester County 28.8. As a contrast, the figure for Devon is 39.2, for Cornwall 36.2, and the borough of Lyme Regis has a population of which 41.6 per cent are over 50 years of age. It is not surprising, therefore, that, as far as figures are available, the south-western region has the highest incidence of cancer of any region in Great Britain.

In the several administrative areas in the Region the incidence of all cases of cancer varies in much the same ratio as the average age of the

population. Thus, excluding Lyme Regis, where the figures for any one year are too small to be significant, it is found that the order of incidence of cancer corresponds with the average age of the population. Devon, with the oldest population, has the highest cancer incidence both in males and females, and Wiltshire with the lowest aged population has the lowest incidence. The figures are striking. Taking 1965, the incidence in Wiltshire is 244 per 100,000, compared with 438 in Devon (Table I).

Many investigations have been carried out concerning the incidence of various forms of cancer in West Cornwall, where the tin mines and the heaps of waste extracted from them have a high degree of radio-activity, but so far it has not been proved that leukaemia or any other form of malignant disease has a particularly high incidence in this area. The only types of malignant tumours which are much more common in Cornwall than elsewhere in Great Britain are cancer of the lip and of the skin, particularly in men, to which I will refer later.

TABLE I
CANCER INCIDENCE 1965
Incidence per 100,000

	<i>Male</i>	<i>Female</i>	<i>Both sexes</i>	<i>Percentage of population aged over 50</i>
Wiltshire	233	254	244	28.5
Gloucester City ..	276	309	293	28.7
Gloucestershire ..	261	265	263	28.8
Plymouth	327	340	333	30.3
Bristol	388	347	368	31.7
Exeter	432	375	403	33.1
Somerset	344	329	336	34.0
Bath	404	371	386	35.1
Cornwall	390	386	388	36.2
Devonshire	442	432	438	39.2

Treatment

It has become customary to record the results of treatment by the five-year survival rate, irrespective of whether the patient has evidence of cancer at the end of that period. The advantage is that it is a figure which is relatively easy to obtain, and provides a fair measure for comparison of results in different countries or by different methods of treatment. But it has its disadvantages. In those types of cancer arising in organs, such as the lung, stomach or pancreas, with a high early mortality rate it gives a good indication of prognosis, for not many patients die of the disease after five years. Of patients with cancer of the stomach who receive some form of treatment only 19 per cent survive two years, and only 7 per cent five years, and very few patients die of unrelated diseases. There are many sites where cancer can be controlled for a number of years, but never completely cured, and in such cases many patients die of the disease in the sixth or subsequent years. In the case of prostatic cancer we find that one-third of those who survive five years die in the following two years, so here the five-year survival rate is most misleading.

The longer that patients are followed up, the greater the proportion who die of unrelated disease. In cancer of the breast 55 per cent of patients fail to survive five years and nearly all the deaths during these years are due to cancer, but in the next five years another 17 per cent die, a third of these deaths being due to unrelated causes.

Many reports of the results of the treatment of cancer describe groups of patients who have been selected in some way or who are treated at special centres where there are experts in a particular branch of treatment, either surgical or radiotherapeutic, and so these reports do not give any idea of the general picture in the country. The results reported from the Registry include all patients concerning whom the diagnosis of malignant disease has been made, and the results of treatment, whether carried out at home or in hospital, by general practitioners or specialists, at cottage hospitals or at special centres. It is worth looking at the reasons why some patients receive no treatment at all except perhaps palliative measures which do not in any way influence the natural progress of the disease. For example, in patients notified as cases of cancer of the stomach or where the death certificate records this diagnosis, 60 per cent (1960 figure) received no surgical or radiotherapeutic treatment, usually because the lesions were quite inoperable at the time that the diagnosis was made.

It may seem surprising that there are patients with stage I cancer of the breast who receive no treatment; in 1960 there were eight examples. Sometimes these tumours are only discovered when the patient has some other terminal illness; thus two of them had no treatment because of old age, being 89 and 90: two others had cardiac disease from which they died within four months of their tumours being discovered; two had other malignant tumours, one of the cervix and the other of the rectum, which caused their deaths; one patient was a mental defective, and in only one case was treatment refused. This was a girl of 19 whose carcinoma had been confirmed by a biopsy, but her parents refused to let her have any treatment, and she died four years later.

It might be thought that in the more remote and rural parts of the region people come later for treatment than in the cities, but if we take the breast as an example this is far from the case. The proportion of all cases which are in stage I at the time of diagnosis should give an indication of this. Taking the 1965 figures, for the region as a whole 39 per cent were in stage I, but in the municipalities the figure was only 35 per cent, and in the counties 41 per cent. Bristol City came off worst with only 32 per cent in stage I, and Cornwall was the best with 45 per cent, followed closely by Devon with 44 per cent.

Special sites

Lip, tongue and mouth

The high incidence of cancer of the lip in Cornwall, and to a lesser extent in Devon, amongst males has already been mentioned. If we con-

sider the two years for which I have figures (1960 and 1965) the incidence for the region as a whole is 4.5 per 100,000. In Devon this rises to 6.0 and in Cornwall to 13.7, a figure three times that for the region as a whole, and nearly five times the incidence found in some parts. Bristol, for example, has an incidence of 2.8. Clay pipes are no longer smoked to any extent in Cornwall so other causes must be looked for. The same difference in incidence does not apply to lesions of the tongue and the rest of the mouth.

Cancer of the lip occurs in an old age group, about a third of the patients being over 70 years. It is slow growing and often curable so that only a minority of the patients die of the disease, two-thirds of the deaths being due to unrelated causes. In spite of this high average age, two out of every three patients survive five years. But it must not be thought that it occurs exclusively in older people, for the 1960 records include a sailor of 26 with a histologically proved squamous cell carcinoma of the lip.

In the tongue and mouth, male patients predominate, though not to the same extent as in the case of the lip. Rather less than a quarter survive five years. The survival rate is better amongst the female patients; perhaps they are more concerned about an ulcer in the mouth and come for treatment earlier. Of the 89 patients with carcinoma of the tongue or mouth registered in 1960 only 11 had block dissections of the nodes of the neck, and four of these are amongst the 24 five-year survivals. I think that this operation might have been practised more often with advantage.

Oesophagus

Cancer of the oesophagus carries a very bad outlook and about 200 people die of it in the south-western region each year. The resection rate, particularly for growths of the lower part, has been slowly rising, and now about a quarter of the patients receive the benefit of this operation.

In the five years between 1956 and 1960, 242 resections were performed. Of these only 28 survived five years, but of 45 patients treated in the last of these years, 10 are surviving. In that year, 39 patients were treated by intubation, but only two of these survived for as much as two years. For growths in the upper third the prognosis seems hopeless, but fortunately more than half the growths occur in the lower third.

Stomach

The incidence of cancer of the stomach in the south-western region is below that for the country as a whole, but if we ignore the exceedingly high incidence in the Liverpool area and North Wales it is about the same as the rest of the country. After running at an incidence of around 35 per 100,000 for as long as there have been reasonably complete figures, with a preponderance of about four males to every three females, there has been since 1960 a steady fall, the male incidence dropping from 44 to 33.4 and the female incidence from a peak of 30.6 in 1959 to 23.6 last year, giving a drop in incidence for both sexes from 30.5 to 28.4. The cause of this fall

is unexplained, but a similar trend has been noticed not only in Britain but also in most western countries (Wynder, 1967). This fall is most welcome for the results of treatment are appallingly bad, and only about 4 per cent of all cases survive five years. It is unlikely that earlier diagnosis will do much to improve the survival rate for it was pointed out a long time ago that if the growth can be resected, the longer that the patient has had symptoms before operation, the better the outlook afterwards. It is a matter of the growth-host relationship.

Of all the cases in the south-western region, taking the 1960 figures, only 278 out of 691, just over 40 per cent, received any operative treatment other than an exploratory laparotomy at which nothing was done. In only 197 of these 278 (70 per cent) was resection of the primary tumour carried out. Of these 39 had a total gastrectomy, 138 had resection of the distal stomach and 20 had an oesophago-gastrectomy. In these groups the five-year survival was one case, 21 cases and one case respectively. One patient who had only a gastro-enterostomy survived five years but died in the sixth year. These results give a five-year survival of only 11.7 per cent of those who had the primary growth resected.

The age range shows that the condition is most common in the seventh and eighth decades of life, and only 35 (5 per cent) of all the patients were under the age of 50 at the time of diagnosis. The distribution in the region shows that, with the exception of Cornwall, the county districts had a lower incidence than the towns, with an exceptionally low incidence in Gloucestershire.

Small intestine

In the decade between 1951 and 1960, 153 cases of malignant tumours of the small intestine were notified to the Registry. Just over half were cases of carcinoma, 18 in the duodenum, 20 in the jejunum and 29 in the ileum, the site being unspecified in 11. Of these the majority were treated by resection but only eight survived five years.

There were 20 cases of argentaffin tumours, one being in the jejunum and the remainder in the ileum. The age range was from 33 to 83 years, and all but two were treated by surgical excision. In spite of this the long-term mortality has been high, for only 12 survived five years and five of these have since died of their disease.

Of the 25 cases of lympho- or reticulo-sarcoma only four survived five years, having been treated by surgical excision and radiotherapy.

Colon

The incidence of carcinoma of the large intestine has shown no significant change during recent years. For the colon it varies between 20 and 24 per 100,000 for men and 31 and 34 for women, which is similar to the rate for England generally. The figures to be discussed all relate to the year 1960. Approximately 24 per cent occur in the right colon below

the hepatic flexure, 22 per cent are in the transverse colon including the flexures, 10 per cent in the descending colon and 44 per cent in the sigmoid. The preponderance of females is greatest in the proximal colon (60 per cent) and gradually decreases until the sigmoid is reached, where they form only 52.5 per cent of the cases, and in the rectum this preponderance is reversed for here males with 57 per cent exceed the females (Table II).

Nearly two-thirds of the patients have no operative treatment, though some of these may have an exploratory laparotomy only. Of those who had surgical treatment other than a laparotomy at which nothing was done, 76 per cent had the primary tumour removed, the resectability rate being highest for tumours in the descending colon (86 per cent). The remaining 24 per cent of the surgically treated cases had either a short circuit operation, or, in a few instances, a colostomy only.

The five-year survival rate for the whole colon in resected cases is 119 out of 320 (38 per cent), being highest in the right colon (43 per cent) and

TABLE II
CARCINOMA OF LARGE INTESTINE
Sex incidence

			<i>Male</i>	<i>Female</i>
			<i>Percentages</i>	
Ascending colon	..	..	40	60
Transverse colon	..	..	45	55
Descending colon	..	..	45	55
Sigmoid colon	..	..	47.5	52.5
Rectum	..	..	57.5	42.5

in the sigmoid (42.5 per cent) and the lowest in the descending colon (19 per cent), but if we consider the survival of all cases it is only 119 out of 595 (20 per cent) for the colon as a whole. This gloomy picture is, of course, due to the extent of the disease when treatment is first instituted. Many patients are admitted with acute intestinal obstruction, often dangerously ill, and have not consulted their doctors before this complication arose. Thus 132 patients (48 per cent) who had no operative treatment or only a palliative operation died within a month of the diagnosis being made. Of those who had the primary growth resected 12.5 per cent died within a month of their operation.

Carcinoma of the colon is most common in the seventh and eighth decades of life, but on the average growths in the sigmoid have a slightly lower age distribution. It is well known that carcinoma in this organ occasionally occurs at an early age, and in the 1960 figures is an example of a girl of 21 with a growth in the descending colon who only survived seven months after its removal.

The incidence varies from 39 per 100,000 in Bath to 11 per 100,000 in Gloucestershire; the urban areas of Bristol, Bath and Gloucester City all have high rates, but in the south-west the incidence is higher in the counties of Devon and Cornwall than in the cities of Exeter and Plymouth.

For every 100 cases of carcinoma of the colon there will be found one or two argentaffin tumours, these being nearly all in the appendix. As a rule, though pathologically invasive, they behave in a much more benign way than those in the small intestine, and rarely recur after appendicectomy; in fact, many of them are not discovered until the appendix is opened after its removal.

Rectum and anal canal

Carcinoma of the rectum in the south-west has an incidence of about 18 per 100,000, being unchanged over the last 10 years. As already mentioned it is more common in males than females. In the 1960 figures the incidence was low in Gloucestershire (8.5) and Somerset (9.7), and highest in Bristol (20.5) and Exeter (24.0). The peak of the age range is reached in the seventies in both sexes, but there is an indication that on the whole the females are a little older than the males, though in the year under consideration there were 18 females in the forties compared with only eight males.

Over three out of every four patients received operative treatment of some sort, and 84 per cent of these (285 out of 338) had the growth removed. The different types of operation are as follows:

			<i>Five-year survivors</i>
Abdomino-perineal resection	192	59	
Anterior resection	55	18	
Perineal excision	9	2	
Hartmann's operation	3	0	
Local excision	22	8	
Excision unspecified	4	0	

Five of the cases are noted as squamous cell carcinoma of the anal canal; two were treated by abdomino-perineal resection and are now dead, two treated by radiotherapy and one by local excision survive. Most of the patients with rectal growths treated by local excision had polypoid tumours described histologically as malignant, and these were resected through an anal operation.

The mortality figures show that of those patients who had the growth resected 36, or 12.7 per cent, died within the first month after operation; a similar proportion died in the next five months, and only 30 per cent survived five years, these constituting only 20 per cent of all cases, whether treated by resection or not. Though the figures may not be significant, the survival rate of treated cases was much better in the western part of the region, being 32.5 per cent for Devon and Cornwall and only 20 per cent for the rest of the region, where, in fact, a smaller proportion of patients received operative treatment.

Pancreas

Before leaving the subject of the alimentary canal, mention must be made of the pancreas, which, with the oesophagus, carries the worst

prognosis of any of the more common forms of malignant disease. Like leaves blown off a tree in autumn after they have turned golden, some 300 people die of the disease in the region each year. It is slightly more common in males than in females, and only 6 per cent occur under the age of 50. In the decade between 1951 and 1960, out of nearly 1,500 cases in the region only 54 patients had radical surgical excision, and of these only six survived five years. There are six patients who survived for this period who had only palliative operations, but in none of these was there histological proof of the diagnosis, and it must be suspected that in all of them the diagnosis was erroneous. In 1960, of 74 patients who had palliative operations, only eight survived more than a year, and only one for more than two years.

Lungs

As in other parts of the country, cancer of the lung has become increasingly frequent, though the incidence in the region in 1965 (92 per 100,000 in males and 16.3 in females) is well below that for the country as a whole.

Though there is no doubt about the increase, this is an example of a type of cancer where the figures must be regarded with a certain degree of reserve, for in only a minority of cases is there histological or autopsy proof of the diagnosis. The incidence follows the well known pattern of being higher in the urban areas and lower in the counties. The highest incidence in the region is found in Bristol, with 53 per 100,000 (both sexes); Bath comes next with 49, and Somerset (31), Wiltshire (32.5) and Cornwall (33) are at the other end of the scale. This is almost a disease confined to the sixth, seventh and eighth decades of life; amongst the 1,100 cases in 1960, only one was under 30, and six in the thirties. Nineteen patients were in the eighties and two over 90.

In reviewing the five-year survival of patients treated in 1960 there were seven patients who had received radiation treatment only, but in none of these was there histological confirmation of the diagnosis. In one the diagnosis is now definitely considered to have been an error; two others have no sign of the disease, and the diagnosis was probably incorrect, and three who survived the five years died in the sixth year.

Less than half the patients received anything more than symptomatic treatment. In 25 chemotherapy was the only treatment administered, and only one of these patients survived more than a year. Those receiving radiotherapy as the initial treatment numbered 272, but 233 of these were dead within a year. It is a sad reflection that in only 217 was surgical resection, which really offers the only hope of cure, undertaken. Pneumonectomy was performed in 135, lobectomy in 78 and segmental resection in four. The early mortality of these was 11.5 per cent, 26 dying within the first month. There were 115 who survived a year, 87 for two years, 68 for three years, 61 for four years and only 49 were alive five years

after their operations, i.e. 22.5 per cent, but this represents less than 5 per cent of all the cases of lung cancer. The numbers who have benefited from surgical treatment have steadily increased from 22 in 1951 to over 200 in recent years, though this still remains at about 20 per cent of all cases.

Breast

Until 1959 cancer of the breast was the most common form of malignant tumour in the region, with an incidence of 82 per 100,000 females or 43 per 100,000 of the total population; but in that year it was overtaken by the lung, to which I have already referred. This is a type of cancer which varies somewhat in its incidence amongst white populations, but there are no apparent differences in the various regions of England and Wales for which figures are available. The number registered each year has slowly increased over the last 15 years, but this is probably due in part to more complete registration and the rising age of the population, though a real increase may be taking place.

It is unfortunate that the proportion of patients referred in stage I has shown no increase over the period, and remains at about 40 per cent, though the change to the T.N.M. staging has rendered comparison with former years unreliable. On the basis of the 1960 and 1965 figures the condition is more frequent in Devon, but this could be accounted for by the greater average age of the population in that county.

When we come to consider results the findings are disappointing, for, taking all cases together there has in the last decade been no improvement in the overall five-year survival rate, which has varied between 38 and 46 per cent. Treatment during the 1950s changed little, and the relatively small number of patients treated by adrenalectomy or hypophysectomy have not influenced the overall figures. During the last two years that are available for five-year survivals 80 patients in stage I have been treated by radical mastectomy, and 298 by radical mastectomy followed by a course of radiotherapy as the initial treatment, and the five-year survival rates are respectively 73 and 67 per cent, thus supporting the evidence that these patients do rather better if they have no radiotherapy unless recurrence appears.

Local mastectomy followed by radiotherapy is widely practised for stage I and II cases by surgeons in the region who have during the last few years treated more patients by this method than by an operation which is described in the records as radical and includes the removal of the axillary lymph nodes. In stage I and II cases the five-year survival has been 67.5 per cent, which is exactly the same as for those treated by radical mastectomy. In view of the age concerned it is not surprising that some patients in these two stages die of causes unrelated to their carcinoma, but those in 1960 accounted for only 26 out of 628 patients in these stages.

I have already referred to those who are in stages I and II who receive no treatment because of other serious illness; the inclusion of these in the statistics does make the prognosis appear rather worse than it really is. Many excellent survival rates have been recorded by surgeons as a result of treatment of selected groups of operable cases. The overall figures cannot match up to this standard. In recent years the five-year survival rate has been for stage I 72 per cent, stage II 48 per cent, stage III 28 per cent and stage IV 4 per cent. It is surprising that there are any five-year survivors in stage IV, but in some patients the disease is very slow growing, and little change in the condition may occur during this period. In 1960 an old lady with a stage IV growth was treated by hormone therapy only and survived five years but succumbed soon after that.

I mentioned that there has been little influence of the operations of adrenalectomy or hypophysectomy on the overall results. In fact, of the 1,038 breast cases registered in 1960, 23 have had an adrenalectomy and 50 a hypophysectomy, but of these only six survived five years after their initial treatment.

If we look further back at the 10-year results we find that of 925 patients registered in 1955, 45 per cent were alive at the end of five years, but only 28 per cent at 10 years, as I have already mentioned, but if we exclude from the 10-year survival those who died of unrelated disease the figure would have been 33 per cent.

Uterus

I will not say much about carcinoma of the uterus, but in the region there has been a change in the ratio between growths of the cervix and those of the body. Up till 1957 the number of cervical growths was appreciably higher, but in that year they were almost equal and since then the numbers of patients with carcinoma of the body have in some years outstripped those of the cervix. This is not due to the introduction of exfoliative cytology for this did not come in till later, but it is a result of a steady increase in the number of growths of the body which have gone up from about 150 registered cases in the early years of the last decade to between 250 and 300 in each of the last few years, with an incidence of about 20 per 100,000 women. At the same time the number of cervical growths has remained fairly constant.

There has been a slight improvement in the stage at which the patients with cancer of the cervix come for treatment, but still less than one-third are in stage I. There has been a similar but small improvement in the five-year survival which averaged 32 per cent in the first three years of the decade, and 40 per cent in the last three years. This improvement is not matched in the case of growths of the body, where techniques of treatment have not changed and the survival rate has remained at a little over 50 per cent.

Kidney

One of the drawbacks of the International System of Classification is that it groups together conditions which are quite different in their behaviour, and so gives rise to statistics which are of little value. A glaring example of this is the kidney, where the three types of characteristic malignant tumours differ from each other in almost every respect except that they arise in the same organ.

Of the 207 patients registered as having kidney tumours in 1959 and 1960, only 126 received any form of treatment directed against the tumour, suggesting that nearly half the patients were in too advanced a state for any but palliative treatment, though in many of these the diagnosis was not proved.

Of the treated cases, 85 tumours were adenocarcinomas, 22 were transitional cell carcinomas and nine were nephroblastomas. The remaining 10 formed a mixed group including four anaplastic carcinomas and three sarcomas.

The patients with adenocarcinomas ranged from eight to 80 years of age, and males slightly preponderated. Twenty-nine survived five years, one of these having had a cerebral metastasis removed in the same year as the nephrectomy.

The 22 cases of transitional cell carcinoma had a rather higher average age, ranging from 43 to 84, and affected the sexes equally. It is a serious condition, and only six out of the 22 survived five years.

The nephroblastomas form an even more depressing subject, for only one of the nine survived as much as a year. He was a boy aged 15 at the time of his nephrectomy, and he died of his disease six years later.

Skin

I have already mentioned that malignant tumours of the skin have a particularly high incidence in the south-western part of the region. Melanomas are discussed separately and the figures to which I refer consist almost entirely of cases of squamous cell carcinoma with a few diagnosed as sebaceous carcinoma and Bowen's disease, but exclude rodent ulcers.

Taking the region as a whole, the incidence, based on 1960 figures, was 7.3 per 100,000, 9.5 for males and 5.3 for females. In Gloucestershire, Wiltshire and Somerset the incidence was well below the average, but in Devon the incidence was 14.3 for males and 9.1 for females. Farther west in Cornwall, the rates are higher still, 20.2 for men and 10.0 for women (14.9 for both sexes), which are just about double those for the region as a whole. These lesions are more common on the exposed parts, 66 per cent occurring on the head or neck, 19 per cent on the upper limbs, 9 per cent on the trunk and 6 per cent on the lower limbs. As might be expected the prognosis is best in those sites where radical treatment, amputation if necessary, can be carried out. Thus the five-year survival

is 72 per cent for the upper limb cases, 64 per cent for the lower limbs, 57 per cent for those on the head and neck and only 47 per cent for those on the trunk. Sixty-eight per cent of all cases had surgical excision as the primary form of treatment, but 75 per cent of the survivors had this treatment.

About 70 malignant melanomas have been registered in the region each year, and the majority receive treatment at the Plastic Surgery Unit at Frenchay Hospital, where they have been carefully recorded by Peterson *et al.* (1962).

The incidence, based on the records for 1960 and 1965, increases as we go farther to the south-west, but not to the same extent as the squamous cell carcinomas. The condition in this region is more than twice as common in females as in males, and, as is well known, the prognosis after treatment is much better in the female sex, in whom the five-year survival rate is well over 50 per cent.

Approximately 40 per cent of these tumours occur on the lower limb, and 30 per cent on the head and neck.

During the decade 1951 to 1960 all the 241 five-year survivors except one had surgical excision as the primary form of treatment, though 23 of these had irradiation in addition. It is unusual for this tumour to cause early death, and only 13 of the 70 patients registered in 1960 died within the first year after registration, though two of them were so advanced that no treatment was undertaken. Compared with many other malignant tumours this lesion has not the black outlook that its name implies, and with thorough treatment the survival rate is most encouraging.

Specialization in treatment

The results which I have quoted, and which give an overall picture of many aspects of malignant disease, may come as a surprise in showing that the survival rate is so poor and many patients receive nothing but palliative treatment, the disease being too advanced by the time that it is diagnosed. This is not the place to discuss such measures as routine X-rays and exfoliative cytology, or the prospects and possible benefits of earlier diagnosis, but I will refer briefly to some of the disappointing results of surgical treatment.

There has been a steady increase in specialization since the National Health Service was introduced. Neurosurgery, thoracic surgery and plastic surgery were established as special units from the start, and I have mentioned some of the excellent results which come from them, particularly as regards cancer of the lung and malignant melanoma. Urological surgery is gradually growing as a speciality in some centres in the region. I have tried to look at the influence of this development from the point of view of malignant disease.

As an example I have taken the 203 nephrectomies for tumours of the kidney performed in the three years up to 1961. These operations were performed by 55 surgeons, an average of less than four each. Twenty-two surgeons operated on a single case each, nine on two cases each and only five surgeons operated on 10 or more patients. The early mortality in the first month of the whole series was 8.4 per cent, but amongst those surgeons who operated on only one or two cases the early mortality was more than double this figure (17.5 per cent).

In a similar way I have compared the results of oesophagectomy for carcinoma of the oesophagus. Of 200 patients, 131 were operated on by surgeons who did more than 20 cases each. They had a mortality during the first month after operation of 27 per cent, and a five-year survival rate of 13 per cent. The remaining 69 patients who were operated on by other surgeons had a mortality of 48 per cent in the first month, and only 4.5 per cent survived five years.

In considering the example of the last 55 pancreatectomies for carcinoma performed before the end of 1960, 14 were by surgeons who only operated on a single case, and another 14 by seven surgeons who did two each. Only three surgeons did five or more during the period. I think that it is fair to say that none of them could be described as experienced at the operation, which had a mortality of 40 per cent during the first month.

I suspect that this pattern of results is not unique to the south-western region. It is not necessary to quote these figures to appreciate that greater experience in particular operative procedures yields better results. As far as I can see we shall only achieve this for the more complex operations for cancer if there is more specialization and patients in need of particular operations are referred to teams with a special interest. Not only will this improve results, but it would provide better opportunities for clinical research. For some of these conditions there is only enough work in a region of three million people for one or two of these special teams. For others such teams will be required in every district hospital, and the patients should be directed to them. I refer to such specialities as upper or lower alimentary tract surgery. If all the suspected cases of cancer of the pancreas in the region had been under the care of one team, I am sure that the resection rate would have been much higher, and the survival rate much improved. This leads to further fragmentation of what was at one time general surgery, but it is the best way of improving results as long as surgical excision remains the main form of treatment, and in this way results may be brought nearer to the standard of those reported by the specialized teams which already exist. I am not advocating cancer surgeons. The specialization will have to follow the systemic separation which is already in being to some extent. We have already achieved greater co-operation between surgeons and radiotherapists; it is now for the surgeons and physicians to put their own house in order in the best

interests of their patients, and for the regional boards to plan larger hospitals where this specialization can be brought about. The time has gone when patients should be segregated into medical or surgical wards. We already have cardiac units where physicians and surgeons work hand in hand. This same principle should be extended to cover alimentary disease, biliary tract disease and kidney and urinary tract disease. With increasing use of many new forms of treatment such as chemotherapy this arrangement may need to be applied to the treatment of all diseases.

In directing patients to special units some resistance still comes from patients and their relatives who do not like to go to a hospital far from their homes. The reasons should be explained to them. Any doctor who needs a serious operation for himself or a member of his family chooses his surgeon most carefully irrespective of how far away he is; the public still need some education in this matter, but they should receive the same benefits.

ACKNOWLEDGEMENTS

Mr. President, I come to the end of this lecture. Thank you for paying me the honour of inviting me to give it.

I wish to express my very great thanks to all the staff of the two Registries, particularly to the chief Record Officers, Major Leyland in Bristol and Mrs. Longstaffe in Plymouth. Six of the staff have been with the Registries for more than 20 years, the two that I have mentioned and Miss Webb, Miss Adams, Mrs. Prowse and Miss Brooks. This is surely a record of faithful service in a good cause.

REFERENCES

- ACHESON, E. D., HADFIELD, E. H., and MACBETH, R. G. (1967) *Lancet*, **1**, 311.
ALDERSON, M. R., and MEADE, T. W. (1967) *Brit. J. prev. soc. Med.* **21**, 22.
DOLL, R. (1967) *Prevention of Cancer*, p. 42. London, Nuffield Provincial Hospitals Trust.
——— PAYNE, P., and WATERHOUSE, J. (1966) *Cancer Incidence in five Continents*. International Union against Cancer. Berlin, Springer.
FAULKNER, K. E., LEYLAND, L., and WOFINDEN, R. C. (1967) *Med. Offr.* **118**, 147.
PETERSON, N. C., BODENHAM, D. C., and LLOYD, O. C. (1962) *Brit. J. plast. Surg.* **15**, 49.
WYNDER, E. L. (1967) In *Racial and Geographic Factors in Tumour Incidence*, ed. A. A. Shivas, p. 41. Edinburgh University Press.

RESEARCH FELLOWSHIP IN BIOLOGICAL ENGINEERING

THE COLLEGE AND the Institution of Mechanical Engineers invite applications for the above Fellowship, to be held jointly at the College and at a department of mechanical science for one year in the first instance. Applicants should be medically qualified or hold an appropriate degree in a scientific or engineering subject. The stipend will be within the range of £2,000–£2,500 p.a., according to age and experience. Further particulars of the conditions applying to the Fellowship may be obtained from the Secretary of the College, by whom detailed applications must be received not later than 31st May 1968.